

than 90%) and commonly show corrosion indicating postdepositional solution. Rock fragments in these sands consist mainly of reworked Tertiary limestone and sandstone.

Near Cape Hatteras, sands of the shelf and upper slope consist mainly of quartz and are characteristically higher in feldspar (10–15%) than the shelf sands on the south. The feldspar is dominated by orthoclase with minor amounts of plagioclase and microcline. This content is in contrast to the high microcline content of the piedmont, coastal-plain rivers, and “southern” shelf sands but is similar to the mineralogy of the sands from the Hatteras abyssal plain. The relatively plentiful microcline and granitic rock fragments on the shelf between Cape Hatteras and Cape Romain suggest that these surficial sands are the result of reworking of older piedmont-coastal plain sands during late Pleistocene. Farther south of Cape Romain the terrigenous fractions have a piedmont signature but are much diluted with relict-residual carbonates and oolitic, algal, and micritic limestone debris.

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PROJECT RULISON AND ECONOMIC POTENTIAL OF NUCLEAR GAS STIMULATION

Project Rulison was designed to determine the potential of underground nuclear stimulation for commercial development of the Mesaverde Formation of the Rulison field in Garfield County, Colorado. A method of stimulation far greater in magnitude and efficiency than conventional hydraulic fracturing is needed to recover the gas at economic rates.

Detailed testing of the Project Rulison exploratory well, R-EX, provided data on geology, hydrology, and reservoir characteristics. The data obtained from the testing have been used to determine the flow capacity of the Mesaverde reservoir. The reservoir characteristics were used as input data to make predictions of post-shot reservoir performance in the nuclear-stimulated well, using a radial, unsteady-state gas-flow computer model. The calculations show that rates of production will be sufficient if costs can be controlled. Costs of nuclear stimulation must be reduced drastically for commercial use. Project Rulison will cost approximately \$3.7 million, excluding lease costs, preliminary tests, and well costs. At such a price, it can not possibly be commercial; however, these costs can be lowered in a logical stepwise fashion.

A nuclear explosive with a design yield of 40 kilotons was emplaced in a 10¾-in. hole at a depth of 8,426 ft below ground surface and detonated on September 10, 1969. A preliminary appraisal of the data taken at shot time indicates that the explosive behaved as predicted. The explosion was contained underground as predicted and no major seismic damage occurred. The post-shot reentry program, in the spring of 1970, will include reservoir testing to determine the degree of stimulation achieved.

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MIETTE PLATFORM EVOLUTION AND RELATION TO OVERLYING BANK (“REEF”) LOCALIZATION, UPPER DEVONIAN, ALBERTA

The Flume Formation exposed in Jasper National Park, Alberta, is a widespread sheetlike carbonate

body, 100–250 ft thick, which served as a platform for the overlying 1,200-ft thick, areally restricted Miette bank of the Cairn and Southesk Formations.

Platform deposition of the present Miette bank began on a pre-Devonian, topographically high erosive surface. During marine transgression across this surface, a broad shelf lagoon formed in which shallow subtidal to supratidal carbonates of the platform evolved. Shoaling conditions were maintained throughout platform evolution over this high by carbonate sedimentation buildup and perhaps gradual uplift. During relatively rapid inundation, most of the platform was covered with basinal carbonate mudstones of the Perdrix Formation. Stromatoporoids were able to survive only on the shallowest parts of the platform. In essence, the overlying Miette bank represents localized continuation of platform growth.

Bankward the lower platform member thins and the upper platform member thickens. As the upper platform member thickens, tidal flat and shallow subtidal deposits appear and thicken, and deeper subtidal deposits thin and disappear. These changes generally occur within 1–5 mi from the bank.

Widespread carbonate units which served as platforms for overlying banks can be important both in determining bank proximity, and in understanding relations between platform genesis, bank inception, and localization.

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PINNACLE-REEF MODEL, ZAMA-VIRGO FIELD, NORTHERN ALBERTA

(No abstract submitted)

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SOME ASPECTS OF PALEOECOLOGY AND STRATIGRAPHY OF LOWER MANCOS SHALE (UPPER CRETACEOUS) OF COLORADO AND UTAH, BASED ON PALYNOLOGIC ANALYSIS

Paleoecology of the deposits in the early Mancos Sea of western Colorado and eastern Utah is being studied by palynologic analysis. Seven sections, including 1 from the type area along the Mancos River, have been sampled at 15–20-ft intervals, from the top of the Dakota upward for 100–600 ft. These strata—the Graneros Shale, Greenhorn Limestone, lower Carlile, Juana Lopez, and upper Carlile Members—include most of the Cenomanian and Turonian stages.

The terrestrial microfossil flora includes more than 45 species of spores, about 15 species of gymnospermous pollen and more than 59 species of angiosperms. The microplankton differentiated include more than 30 species of acritarchs and about 40 species of dinoflagellates.

Much of the deposition took place relatively close to the shoreline but some sections were farther from the strand. Variations in the sections also indicate transgressive and regressive stages of the sea and some environmental control over the microplankton. Some stratigraphic zonation seems possible, principally on the terrestrial palynomorphs, and correlation and relative time of deposition of the several sections have been determined tentatively.